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these organisms to light, oxygen, and organic substances. With regard to light, the purple bacteria do not ordinarily show positive phototaxis, but are incited to motility which continues for some time after the light is removed. They are not able to obtain carbon from carbon dioxid in the presence of light. Some forms are even anaerobic, and, unlike most pigment bacteria, can produce pigment under this condition. As to the pigment itself, MOLISCH distinguishes two kinds: the red (*bacteriopurpurin*) and a green (*bacteriochlorin*). The latter is distinct from cholorophyll, which fact agrees with that of their inability to use CO_2. MOLISCH concludes that nutrition from organic substance is somewhat related to light and the presence of pigment as shown by the increased energy caused by light; and that thus these forms stand between the colorless bacteria and the green algae.—MARY HEFFERAN.

The typhoid-coli group of bacilli.—Numerous methods have been proposed for the ready separation and identification of the typhoid and the colon bacilli in water. Such special media as LÖFFLER's malachite-green, MACCONKEY's lactose-bile, ENDO's lactose-fuchsin, and CONRADI-DRIGALSKY's crystal-violet, have been more or less successful in the hands of various workers. These are based upon substances which restrain the growth of one type of organism while allowing a characteristic development of the other. DUCAMP[4] proposes for this purpose the use of an "antibacilliary" broth prepared by cultivating in a lactose-peptone solution several strains of *B. coli*, for example, derived from different sources. This broth, when finally filtered germ-free, will be exhausted as a medium for *B. coli*, but will still allow the growth of *B. typhosus*. For the rapid detection of the latter in water, the sample is first plated in phenol broth and inoculations made from the colonies into lactose broth. If a race thus obtained grows in the anticoli and not in the antityphoid broth, and is agglutinated 1:50 by typhoid serum, it is undoubtedly *B. typhosus*.

Studies on the fermentative activities of the typhoid-coli-dysentery group resulted in the confirmation of some facts already known, and brought out some new affinities. *B. para-typhosus*, *B. enteritidis*, *B. psittacosis* Danysz and Thomassen, and hog cholera ferment the same sugars except for two races of hog cholera, which are inactive on xylose, dulcite, and mannose. *B. para-typhosus* Kurth in addition ferments saccharose and raffinose. *B. para-typhosus* A differs with respect to xylose, mannose, and dulcite.—MARY HEFFERAN.

NOTES FOR STUDENTS

Subterranean fungi.—ED. FISCHER has recently made a contribution[5] to the morphology of the fungi. The paper is based on the study of material collected by Dr. W. A. SETCHELL and Dr. N. L. GARDNER in the region of Berkeley, California, during the years 1903–1905. It is of especial interest and importance in view of the fact that so little attention has been given heretofore to the collection of subterranean fungi in North America, and because this new material, some of it in young stages, has enabled the author to put some of the imperfectly described genera of HARKNESS on a better footing, and to revise some of his own opinions as to the systematic position of certain genera which have occupied an unsatisfactory position.

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[4] DUCAMP, LOUIS, Contribution à l'étude de la différentiation du colibacille et du bacille typhique. Action des bacilles du groupe coli-typho-dyssentérique sur les hydrates de carbone. pp. 181. *pl. 1*. Thesis. Lille. 1907.

[5] FISCHER, ED., Zur Morphologie der Hypogaeen. Bot. Zeit. **66**:141–168. *pl. 6*. 1908.

Some of the more important results are as follows: *Myrmecocystis cerebriformis* Harkness and *M. candida* Harkness are shown to be identical, the former being an older and mature stage, while the latter is unripe material of the same species. The former name has precedence. *Myrmecocystis* Harkness (1899) is also shown to be generically identical with *Pseudogenea vallisumbrosae* Bucholtz (1900), and the latter becomes *M. vallisumbrosae* (Bucholtz) E. Fischer. Young material of Piersonia, a genus imperfectly described by HARKNESS from old material, shows that this is a very interesting genus. The small nests of asci in the interior of the fruit body are arranged in separate, pouchlike segments of hymenia, with the free ends of the asci facing open passages or chambers terminating the *venae externae*, the point of junction being rather abruptly narrowed. Paraphyses are irregularly distributed among the asci in groups or partly wanting, but line the surface of the *venae externae*. The latter in the deeper parts of the fruit body are filled with a loose weft of hyaline hyphae developed from the ends of certain of the paraphyses; while toward the external portion of the fruit body brown hyphae are intermingled and become more abundant as the openings of the *venae externae* are reached. In the arrangement and form of the asci Piersonia resembles Pachyphloeus, the absence of hyphae in the hymenia-lined passages recalls Hydnotrya; but the most characteristic feature in which Piersonia differs from other genera is the sharply localized condition of the hymenial parts, since in all other Eutuberineae the *venae externae* are lined throughout by the hymenium. In this respect Piersonia represents a special type at one extreme of an arm in the series Eutuberineae, in which the ascus hymenium has disappeared from a large portion of the *venae externae* and is found only at the innermost terminations of the infolding of the same. FISCHER suggests that Piersonia may give the clue to the proper interpretation of the structure of Choiromyces which he has formerly placed with the Plectascineae, where it certainly occupies a rather anomalous position with its distinct hymenium. His suggestion now is that the large, irregular pouchlike hymenial portions in the fruit body of Choiromyces may, like the smaller ones of Piersonia, stand at the terminations of the *venae externae*, which in Choiromyces have become completely and evenly filled, and all evidence of their communication with the outside may have thus disappeared. FISCHER merely offers this as a suggestion. It will require developmental studies of young material to decide the point. Should this prove to be the true interpretation, it would lend some support to MATTIROLO'S view that the difference between the Plectascales and Tuberales is not fundamentally sufficient to warrant their separation into two groups, although FISCHER has contended, and still maintains, that there is no intermediate type between the two groups; since if his suggestion as to the interpretation of Choiromyces proves to be correct, this anomalous structure would indicate subsequent modification of the *venae externae* and not an ontogenetic connection with the Plectascineae.

Pseudohydnotrya, founded by FISCHER in 1896 on material from California, he now finds is not related to *Hydnotrya* Berk. and Broome, a member of the Eutuberineae, but is generically identical with *Geopora* Harkness, which is closely related to *Hydnocystis* Tul. The fruit body of Hydnocystis possesses a single large hollow space which opens to the outside, though the opening is filled with hairs. The wall of the hollow space is clothed with the hymenium. Geopora is a Hydnocystis in which the hymenial walls are deeply infolded in an irregular and complicated manner, in some species closed from the outside, in others communicating in some places with infoldings of the external walls. All recent students of this group agree in placing Hydnocystis among the Pezizaceae, and FISCHER locates Geopora here also, although he formerly placed these two genera among the Balsamiaceae, where they occupied an anomalous position.

One of the very interesting forms proved to be the type of a new genus, *Pseudobalsamia*, which resembles Balsamia in external appearance, but differs in the presence of *venae externae* which open to the outside, thus agreeing with the Eutuberineae. It also differs from Balsamia in the absence of distinct trama plates or veins (*venae internae*), or rather in the masking of them by the irregular distribution of the asci among the tissue elements. In this latter character it resembles the Plectascineae. The *venae externae*, however, are lined with paraphyses, and occasionally asci are found in this layer parallel with the paraphyses. Pseudobalsamia, then, is regarded as one of the Eutuberineae, in which by secondary modification the asci have withdrawn from their regular position in a hymenium and have become intermingled with the elements of the trama, thus simulating one of the characters of the Plectascineae, without showing any ontogenetic connection with that series. This leads FISCHER to regard Hydnobolites, formerly placed by him in the Plectascineae, as one of the Eutuberineae, since the hymenium has probably undergone a similar modification, and the *venae externae* open to the outside. This view of the relationship of these two genera is strengthened by the well-known fact that the asci are often distributed in the trama in certain species of Tuber, as in *T. brumale*, and *T. rufum;* while BUCHOLTZ has shown that in the development of *T. puberulum* the tissue corresponding to the trama areas (*venae internae*) become compressed and changed by the pressure of the developing asci.

The modification which FISCHER's views on the systematic arrangement of the ascomycetous Hypogeae have undergone as a result of this study are expressed in a résumé. Briefly this is as follows:

1. The *Plectascineae series*, with asci scattered in the tissue of the interior of the fruit body, or in groups, not forming hymenia, includes the two families Elaphomycetaceae and Terfeziaceae. In the latter family remain the genera

Eoterfezia (as a simple form), Terfezia, Tirmania, Terfeziopsis, Picoa (incl. Phaeangium), Delastria, Delastreopsis (as higher differentiated forms). Genabea, Choiromyces, and perhaps also Hydnobolites and Pseudobalsamia are excluded from the Plectascineae, and probably go to the Eutuberineae series.

2. The *Balsamiaceae*, with asci in definite hymenia lining the walls of chambers closed to the outside, includes the single genus Balsamia. Hydnocystis and Geopora go to the Pezizaceae. (See ED. FISCHER, Hedw. **30**:56–60. 1898.)

3. The *Eutuberineae series*, with hymenia lining the walls of interior passages which open to the outside and are either hollow or more or less filled with hyphal wefts (asci rarely withdrawn from hymenia into the trama), includes the gymnocarpic forms and are probably derived from the simpler Helvellales like Rhizina and Sphaerosoma.

Since the second series is represented by the single genus Balsamia, with a hymenium lining interior passages of the fruit body, one is led to inquire if it would not be a more satisfactory arrangement to recognize two series: (1) the Plectascales as outlined above, and (2) the Tuberales, including the Eutuberineae and Balsamia. May it not be possible that Balsamia has been derived from some of the Eutuberineae by a secondary modification of such a nature that the interior passages have become closed from the outside; just as in Geopora, as FISCHER points out, examples occur in which such a secondary modification has probably taken place? The development of Balsamia should be studied with this in view.

Among the basidiomycetous Hypogeae several collections of Hysterangium furnish additional evidence of the existence of a *Hysterangium-Clathraceae series* beginning with Gautieria, and then passing from Hysterangium through Phallogaster, Protubera, etc., to the Clathraceae.

The paper abounds in speculative discussion as to relationship and ontogeny, which is a characteristic of FISCHER'S contributions. In a number of instances his views seem to be based on rather insufficient evidence, which is perhaps the chief adverse criticism which may be made on this contribution. Some of them appear to be well founded, and certainly his present views on the classification of the ascomycetous Hypogeae are to me much more satisfactory than his arrangement in ENGLER & PRANTL'S *Pflanzenfamilien*. It should be said, however, that all his suggestions and speculations are stimulating to thought, and I trust will also stimulate collectors and investigators to bring to the light the riches in subterranean fungi which are awaiting us in this large field of North America.—GEO. F. ATKINSON.

Cytological basis of Mendelism.—GRÉGOIRE[6] has published a critical discussion of current cytological theories, with particular reference to their bearing on the interpretation of Mendelian phenomena. Certain fundamental hypotheses

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[6] GRÉGOIRE, V., Les fondements cytologiques des théories courantes sur l'hérédité Mendélienne. Ann. Soc. Roy. Zool. et Malacol. Belgique **42**:267–320. *figs. 4.* 1907.